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The improvement of the teaching of general science in the junior high school.

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Thesis

"THE IMPROVEMENT OF THE TEACHING OF GENERAL SCIENCE IN THE JUNIOR HIGH SCHOOL"

Submitted by

Samuel Francis Frolio

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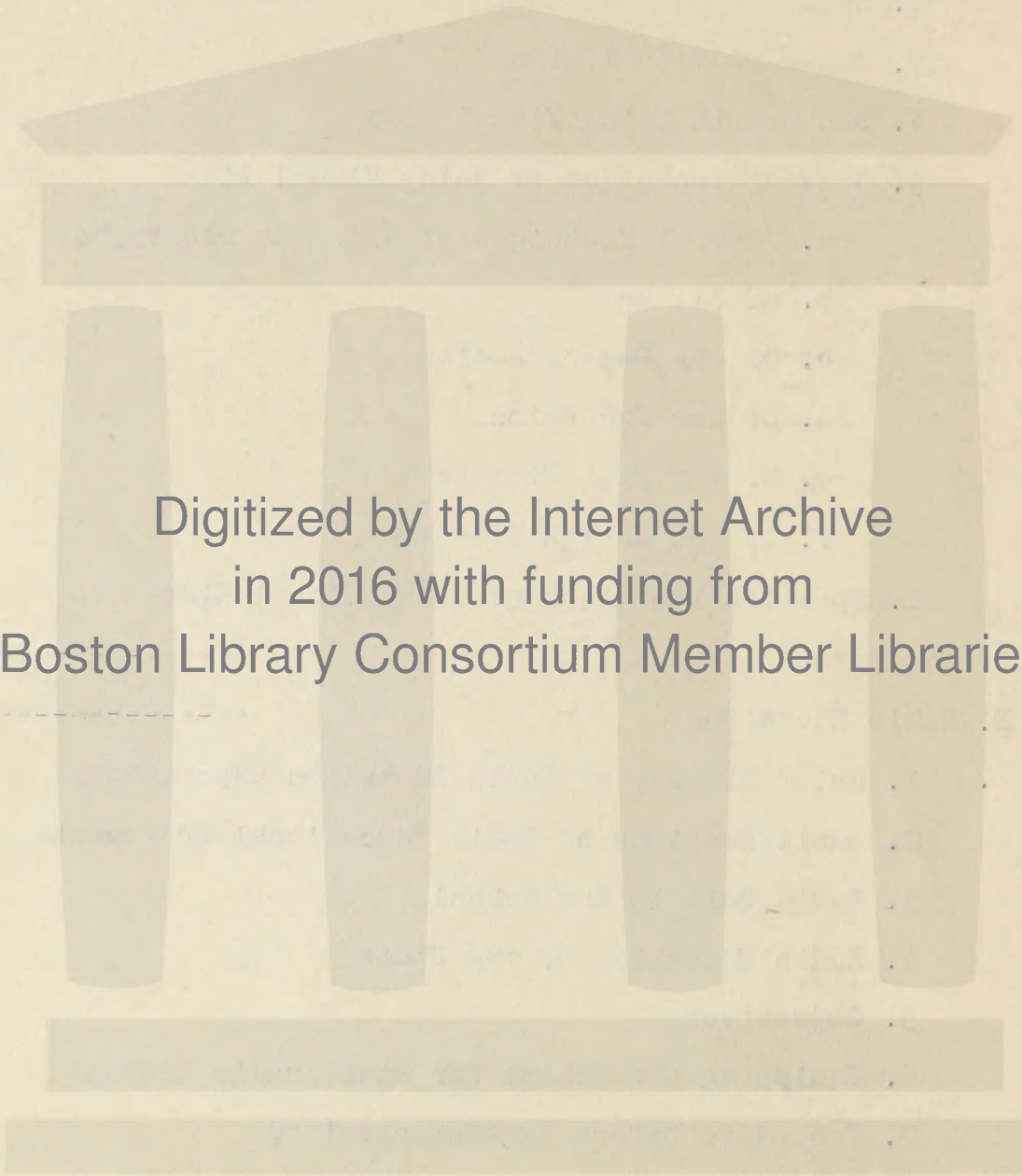
OUTLINE OF THE "IMPROVEMENT OF THE TEACHING OF GENERAL SCIENCE IN THE JUNIOR HIGH SCHOOL"



Brief History of General Science

General Science first came into vogue about 1905, but took the form of elementary physics as an introduction to the scientific study of common phenomena. L.D. Higgins, PhB., wrote a book of this type, entitled "First Science Book" which was published by the Ginn and Co., in 1905. At this time General Science, as it was conceived, was taught only in the ninth grade.

Between 1905 and 1910 (the period of the new Junior High School movement) we note that the content of the General Science study under-went several changes until finally we had, in about 1912, the present day idea of General Science.

Instead of studying elementary physics, alone, Hygiene, Physiology, Biology, Chemistry and such branches of Science, were included. Formerly, the students studied of Matter and Energy, Fluid Pressure, Motion and Force, Heat and Energy, Sound, Light, Electricity, with, possibly, a little of Chemistry, such as, Common Substances (oxygen, iron, sugars and such), Common Chemical Processes, such as Combustion, Explosion, Flame, etc.

With the Introduction of the several branches of Science under the term of "General Science", the students were able to learn about, The Air We Breathe, The Food We Eat, The Water We Drink, Weather and Its Changes, Fire, Heat, Light, Electricity, Clothes, Bacteria, Planet and Solar Systems, Plant Life, Health, Sanitation and such, each instructor adapting his course and subject matter to the students he has at hand.

Gradually this new form of General Science seeped its way from the ninth grade into the eighth, and today it plays no small

part in the seventh grade curriculum as will be seen in the Present Status of General Science to follow.

"THE IMPROVEMENT OF THE TEACHING OF GENERAL SCIENCE IN THE JUNIOR HIGH SCHOOL"

The Present Status Of General Science In the Junior High School

In order to bring about an improvement in the teaching of General Science in the Junior High Schools, it becomes necessary to know the present status of General Science and its teaching.

The present status has been obtained first, from a survey of the records of 125 selected Junior High Schools made available through the State House, Department of Education and second, by sending a questionnaire to the outstanding Junior High Schools of Massachusetts.

The first, in a tabulated form reveals the following facts:

No. Of J.H.S. in Mass.,	Grades						Schools Lacking	Total
Teaching General Science in	7	8	9	7&8	8&9	7,8,9	Gen.Sc.	
As an elective subject	7	6	26	12	21	22		94
As a required subject	3	6	3	2	5	1		20
Gen.Sc.Replaced by Hygiene							11	11
Totals	10	12	29	14	26	23	11	125

In the first column we observe that there are ten Junior High Schools which have General Science in the seventh grade. Of these ten, only three require it while seven offer it as an elective subject. In the second column there are twelve Junior High Schools which offer it in the eighth grade, of which six require General Science in their curriculum while six include it as an elective. In the third column we observe that there are twenty-nine schools which offer General Science in the ninth grade, Three of which require it while twenty-six on the other hand offer it as an elective. In the fourth column we find that there are fourteen Junior High Schools that have General Science in both

the seventh and eighth grades while in the fifth column there are twenty-six that favor it both in the eight and ninth grades.

We note that there are in the sixth column twenty-three schools which offer general science in the seventh, eighth and ninth grades, twenty-two of which offer it as an elective subject in their curriculum in all of the three grades. In the last column we note that there are eleven Junior High Schools which have not as yet incorporated General Science in their curriculum.

This survey also brought out the fact that out of the 125 Junior High Schools considered, fifty-eight not only have adopted the new subject of General Science but have also retained Hygiene either in the seventh, or seventh and eighth grades.

The second, that is, the questionnaire, revealed the following situations:

1. That of the Junior High Schools offering General Science in all of the grades, the unit system of teaching seems to be outstanding.

2. That one of the following standard textbooks is being used as a basal text and is further supplemented by a list of scientific reference books, magazines and pamphlets available for the pupils. The outstanding books used are: Our Surroundings--Clement, Collister and Thurston-Iroquois Publishing Co.; Our Environment:-Its Relation to Us, Book I; How We Adapt Ourselves To It, Book II; and How We Use and Control it, Book III-Carpenter and Wood-Allyn and Bacon; Everyday Problems in Science-Pieper and Beauchamp-Scott, Foresman & Co; Science Of Common Things-Tower & Lunt-D.C. Heath & Co.; Problems in General Science-

Hunter and Whitman-American Book Co.; A General Science Workbook-Lake, Welton, and Adell-Silver, Burdett and Co.; Introduction to Science-Caldwell and Curtis-Ginn and Co.; Trees, Stars and Birds Moseley-World Book Co.; Elements of General Science with Experiments-Caldwell and Eikenberry-Ginn and Co.; Open Door to Science with Experiments-Caldwell and Meier-Ginn and Co.; Science of Home and Community-Trafton-MacMillan Co.; Civic Science in the Home and Community-Hunter and Whitman-Ginn and Co.; Junior Science Revised Edition-Hessler-Benj. H. Sanborn and Co.; Early Steps in Science-Webb and Didcoct-D. Appleton Co.; Common Science-Washburn-World Book Co.; A Student's Laboratory Guide and Project Book in General Science-Collister and Thurston-Iroquois Publishing Co.; Inc.

3. That general science is further supplemented by visual education in some form, that is, by motion pictures; stereopticon slides; flat pictures; exhibits; graphic charts, etc.

4. That very little radio education has at present, been provided, but in anticipation of a greater demand for radio education in the near future, the newer Junior High Schools and even some of the older ones are installing radio equipment in preparedness for this coming event.

5. That the years of preparation of the General Science teachers ranges all the way from normal school graduates to those possessing a masters degree either in Science or Education.

6. That only a few teachers have taken courses in "How To Teach General Science:.

7. In answer to the question "What Do You Consider to be

the objection which would have to be overcome in order that General Science may be acceptable and incorporated in the curriculum of the seventh, eighth, and ninth grades in all Junior High Schools, all seem to agree that well trained teachers who understand the subject matter from the pupil's point of view and suitable equipment must be had.

In conclusion to the above survey we can state the following facts:

1. 23.2 percent of the Junior High Schools in Massachusetts have incorporated General Science in the ninth grade; 20.8 percent in the eighth and ninth grade and 18.4 percent in the seventh, eighth, and ninth grades. This alone shows that there is a gradual trend towards offering General Science as an elective subject in all of the grades of the Junior High Schools, since formerly General Science was considered to be only a high school or ninth grade subject.

2. 46.5 percent include Hygiene either in the seventh or seventh and eighth grades with General Science coming in the ninth grade. As each community adopts a physical education program we find General Science replacing Hygiene in the seventh and eighth grades.

3. That only 8.8 percent of all the Junior High Schools in Massachusetts have not as yet introduced General Science in their curriculum in any of the grades.

4. That due to the fact that General Science has not been introduced in all of the Junior High Schools as well as in all of the grades of those Junior High Schools offering it there is

a need for the improvement of general science teaching and that well trained teachers fully interested in the subject from the pupil's point of view as well as suitable equipment will aid in the solution of this problem.

Aims And Objectives Of General Science Teaching

All of the aims and objectives of teaching General Science are based upon the Seven Cardinal Principles, although each author may clothe his aims in different phrases.

An article entitled "The Reorganization Of Science In Secondary Schools"[1] reads that six of the Seven Cardinal Principles are used very effectively as aims in science teaching.

1. Health--It is the duty of the school to furnish such material for all pupils as will give them a wide knowledge and practice of the foundational principles of personal hygiene and public sanitation, which will bring about the control and elimination of disease, the provision of adequate hospital facilities and medical inspection, and the maintenance of the public health.

2. Worthy Home Membership--General Science, Biology, Physiology, Physics, Chemistry, all have definite places in the proper organization, use, and support of home life. They should not only be studied by those who have the care of the home and children, but other members of the household as well since they may be called upon to make repairs to the heating, lighting, ventilating systems, etc. Science has devised many conveniences that make the modern home comfortable and attractive, and science knowledge is required for their full appreciation and most intelligent use.

3. Vocation--Science instruction should contribute both to vocational guidance and to a broad preparation for vocation. In the field of vocational preparation, courses in shop physics, applied electricity, applied electricity, physics of the home,

[1]Bull. 1920, No. 26, Dept. Of The Interior, Bur. Of Ed.

industrial and household chemistry, applied biological science, physiology, and hygiene will be of value to many students if properly adapted to their needs. Often a knowledge of the underlying principles increases the worker's enjoyment, helping him to think intelligently about and to understand the processes with which he deals. Moreover, such knowledge and interest aroused thereby may result in improving the work itself, and may result in inventions for the improvement of the work of others.

4. Citizenship--Society needs to have a much greater appreciation for the work of scientifically trained men and women. Science teaching should therefore be especially valuable in the field of citizenship because of the increased respect which the citizen should obtain for the expert, and should increase his ability to select experts wisely for positions requiring expert knowledge. It should also furnish a foundation for an intelligent evaluation of the services rendered by such experts.

5. Use of Leisure Time--Science provides an opportunity for many useful and pleasurable avocations, but in order to have avocational value, science courses should employ methods that can be used after school days--trips to industrial plants to study raw materials, processes, and finished products, and visits to museums. In the city and in the country, at the seashore, mountains, lakes, and such, abounds nature in many wonders. If the natural interest in such things has been developed and deepened by study of Biology, Botany, Zoology, General Science, not only is there added pleasure and enjoyment, but the door has been opened to wider interests, and to a rapidly growing fund of valu-

able literature regarding science.

6. Ethical Character--Science study should assist in the development of ethical character by establishing a more adequate conception of truth and a confidence in the laws of cause and effect. Science, along with other studies that exalt truth and establish laws, should help develop sane and sound methods of thinking upon the problems of life.

The ultimate and practical goal of any science study is the desirable modification of the life of the student, therefore science study materials and methods of study and instruction must be analyzed to find out what knowledge, attitudes, habits, appreciations, interests and ideals are most worth while.

C.J. Pieper and W.L. Beauchamp in their "Teachers' Guide Book" list four objectives that they believe to be the most important fundamental purposes of science study. They also admit that there are many additional good objectives, however, that they haven't listed. The four objectives are:

1. The acquisition of knowledge which leads to an understanding of the elementary forces, materials, and phenomena of the science necessary to the citizen of any modern community in the solution of everyday problems of social and civic significance.

2. The discovery and development of desirable study attitudes, study habits, abilities, and skills which lead the youth to do and to act, in the schoolroom and out, as a wholesome participating member of society. The study attitudes and habits will include a spirit of inquiry and investigation, a desire to

see and to solve science problems arising in his environment, a thorough method of investigation of a problem through reading, experimentation, and other educative activities, the formulation of concepts and conclusions which are valid in the light of the student's investigation, and the interpretation of new problem situations upon the basis of the knowledge gained.

3. The development of and growth in desirable attitudes toward, appreciations of, and adaptations to our environment in so far as an elementary knowledge of science and the proper development of the attitudes and habits of study, the abilities, and the skills make this possible.

4. The development of wholesome intellectual interests which lead to a desirable use of leisure time and which give a basis for educational and vocational guidance.

It should be borne in mind by teachers of science that subject matter which leads to information only will never insure the attainment of the objectives stated. The contents or the materials of the course are nothing more than the medium for study. The technique of study and instruction will determine largely whether or not the objectives mentioned above will be reached. The changes produced in boys and girls through the study of science depend upon how well the teacher keeps these objectives consciously before his pupils by the selection of the proper kind of subject matter and by the technique of study employed.

C.J. Pieper[1] expresses his idea of the aims and objectives of General Science study as follows: To develop in the individ-

[1] C.J. Pieper--The Supervision of Natural Science--in Uhl and Others--The Supervision of Secondary Subjects

ual, intelligent and sensible mode of adjustment to the physical and biological world; for the enjoyment of the materials, forces, phenomena and applications which constitute our environment; To develop appreciation of the significance of natural phenomena; for the maintenance of Physical health and energy through the proper relations with nature's forces, materials, and phenomena; To develop efficient use and control of nature's forces and materials; for the intellectual interest in all of the major individuals and social life problems which relate to the judgement to the environment; the scientific attitudes toward, and study of the environmental relationships.

C.O. Davis[1] states the objectives of General Science in Rochester, New York as: To develop the student's power of observation so that he may be aware of his surroundings in a way that will enrich his experience; to give the students an understanding of the common phenomena of their immediate environment; to provide opportunity for practice in applying what has been learned to the solution of new problems; to correct misinterpretations of natural phenomena; to give students some idea of scientific methods of procedure in dealing with problems of a scientific nature.

There are seven general objectives constantly stressed in the teaching of General Science. They are: To acquaint the student with the elementary laws of nature necessary for the maintenance of his own and his community's health; to give the student an understanding and an appreciation of natural laws and their scientific applications to civic problems to the end that

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[1] C.O. Davis--Junior High School Education

he may become an intelligent citizen; to give the student a comprehensive general survey of the field of science that he may have a broad view of the scientific facts and principles which affect his life; to give the student training in ideals and habits, accuracy, open mindednesses, and honesty; to give pupils a broad and genuine appreciation of what the development of science means in modern social, industrial, and national life; to develop system, order, neatness and possibly other attributes to the end that they will function in the ordinary affairs of life; to make pupils able to read more intelligently and with greater interest, articles on science in magazines and scientific books of a popular character and to read with greater understanding, literature containing scientific allusions.

Wood and Carpenter express the aims of General Science in the following way:

1. To increase pupils' appreciation of the factors of his Environment.

2. To develop his powers of observation

3. To train him in the scientific method

4. To stimulate him to organize his common experiences for use in solution of new problems.

5. To help him form right habits

6. To develop his desire to practice personal hygiene

7. To teach him the specific ways in which the principles of Science are applied to the work of the world so that he may surely realize the importance of Science in the home, community, state, nation, and world at large.

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[1] Wood and Carpenter--"Our Environment: How We Use It"

Qualifications Of General Science Teachers

In the Colonial Period very little though was given to the Past training of teachers. Ministers and other college graduates, because of their schooling, were employed in grammar schools. Persons who had studied and who were supposed to know a subject were considered capable of teaching it.

During the first half of the nineteenth century in the United States the only purpose of the school was for the mastery of knowledge, and the work of the teacher was to give assignments, hear recitations and command discipline. Visiting committees of school trustees inspected the teaching by having pupils spell, recite facts and do sums. Therefore the need for training was indeed small. A little mediocre knowledge from common schools or academies of the time, plus the ability to hold discipline were all that was necessary for a person to become a teacher.[1]

In 1823 Samuel R. Hall established a private school for the training of teachers at Concord, Vermont. This tuition school marked the actual beginning of the present day idea of teacher training.

In 1839 Carter, Mann, and Dwight opened the first state normal school in America at Lexington, Massachusetts and this marked the beginning of public teacher training schools.[2]

It wasn't until 1890 however, that the normal school and teacher training became firmly fixed in American minds as essential to public education. Since 1900 a number of state teacher training institutions have been formed, while a few states have attempted to supply summer courses, high school training courses,

[1] Cubberley--Public School Administration

[2] Kyte--How To Supervise

county normal school courses, etc., to supplement the regular work of their normal schools.

In spite of all this ambition towards teacher training by 1923 it was found that not over fifty percent. of the teachers of United States had had a standard training (four years of high and two of professional training). The majority of the best trained teachers were found in the cities while the villages and rural schools had to content themselves with untrained or poorly educated teachers.

Each school should have a minimum standard of training that Present it will accept. E.E. Lewis in his "Personal Problems of the Teaching Staff" states that the minimum standard for grades 1-6 in many cities are four years of high and two years of normal, while some require four years of normal or college. The high school demands a college graduate and sometimes requires from one half to one full year of graduate work, while the Junior High as it is struggling for a foothold in the school system is gradually demanding college trained teachers to carry out their real ideals.

Another requirement of teachers, that has developed but recently is, the thorough training in one to three special subjects. The day of the general teacher has passed. In the early days the curricula consisted mainly of Reading, Writing, and Arithmetic with a smattering, here and there, of Nature Study, Hygiene, and Geography. As Educational ideas advanced however, the gradual division of labor or unit system developed. Instead of one teacher for all subjects, a General Science teacher, an English

teacher, a Geography teacher, etc., now prevail. Parallel with this gradual division of labor a new idea "that lower grades need as equally skilled and trained teachers as the senior high school" has developed, but has not as yet been carried out in all parts of the country.

From an article by Dean Arthur Wilde of Boston University[1] Futur it seems that the minimum qualifications for a good General Science teacher should be as follows:

1. A full college course with two years of enough majoring and minoring carried through two years.

2. Graduate work

a. Including a course in the Psychology of the Adolescence age.

b. Educational Sociology, to orient the school in life of the community and a course in Secondary Education--organization, principles, and methods in high school teaching.

c. Also a course in the practice of teaching General Science.

Dean Wilde concludes his article by predicting that the time will soon arrive when appointment in the better schools will be almost impossible unless the above is offered.

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[1] Wilde A. American Education, Jan. 1927

PART II

THE REORGANIZATION OF THE TECHNIQUE OF THE TEACHING OF GENERAL SCIENCE IN THE JUNIOR HIGH SCHOOL

Salary Schedule As Stimulant For Self-Improvement

In order, however, that the present day teacher may gain these added yet needed requirements, it seems but right that the teacher should receive some sort of financial support from the schools.

Purchasing Power Of Teachers Salary

According to Frank W. Ballou[1], the dollar of a teacher's salary was greater in purchasing power in 1900 than in 1927. If a teacher received a salary of $1000 in 1900, it should have been $1207 in 1910; $2694 in 1920; and $2240 in 1927, if the purchasing power of that salary were to remain constant during the twenty-seven years.

W.W. Ludeman[2] Dean of Education, Southern State Normal School, Springfield, S.D. states that the teacher must receive an adequate salary so that she may enter the social life of the community and so that she can spend her summers and spare time in self-improvement. He speaks strongly against boards that hire the low priced teacher as against the higher priced one. His conclusions are that if the students are to receive expert attention, the skilled and experienced, which means high-priced teacher is necessary. He also believes that as the teacher advances in experience and self-improvement she should be rewarded by increased salary to cover the expense of self-improvement and as a stimulation to continue her good work.

Ludeman concludes his article by saying that when salaries for teachers are more carefully, clearly calculated upon a fair basis to all members of the profession, then will the general teaching efficiency be higher.

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[1] Ballou F.W.--Common Ground--Feb. 1929

[2] Ludeman W.W.--Education--June 1927

Many authors fully agree to the single salary schedule, that is, equal pay for equal work regardless of grades taught. This type of schedule is being used, at present, by sixteen percent of the American cities. This is certainly a good showing, for the single salary idea is a comparatively recent development.[1]

Superintendent R.C. Clark, Seymour, Connecticut in his article, "Principles of Advancing the Salary of Teachers"[2] states that by the single salary plan a teacher of the first grade who has a bachelors degree, is on a salary schedule identical with that of a teacher who has a similar degree but is teaching Senior English in the high school, while on the other hand, any teacher with only two years of training beyond the high school will receive the same salary whether she teaches in the elementary grades or high school. He also lists several merits of the single salary schedule: 1. Comparatively easy to administer; 2. Grade teaching enriched and strengthened by more breadth of knowledge and more technical preparation than represented by the two years of normal training (minimum requirement for entering elementary teaching); 3. Incentive to further preparation in both grade and high school positions and makes it economically practical; 4. Ambitious, well-trained grade teachers have no need to transfer to high school teaching for financial reasons; 5. Best of teachers kept in seventh and eighth grades where they are sadly needed.

Merits Of Single Salary Schedule

W.J. Webster Superintendent of Schools, Minneapolis, Minnesota also agrees with the single salary schedule, which has been put into effect in his schools. He states that teachers can be

[1] Sooy W.--Education--Jan. 1929--Single Salary Schedule

[2] Clark R.C.--Am. School Board Journ.--March 1930

improved during service and that "Dame Experience", still presides over the most efficient school. He also believes that the aim of every superintendent should be to make this school alluring. The danger always exists that when a passing degree of efficiency has been reached, satisfaction will set in, which results in psycho-paralysis.

Single Salary Schedule In Actual Operation

Webster says that the single salary schedule was adopted in his schools six years ago, but that it consists of only two classes of teachers: class one, two years beyond high school; class two, four years beyond high school. The salary for class one starts at $1200 and advances to $2000 while class two starts at $1500 and goes to $2500. As a result of this new stimulant for self-improvement, he noticed that twenty teachers have passed from one class to the second, and that there are now thirty-eight elementary teachers with University degrees, over the twenty-eight of six years ago. He finally draws his conclusion that the extra five hundred dollar opportunity of the second class had some effect in stimulating self-improvement.[1]

Items Necessary For An Adequate Salary Schedule

Frank W. Ballou[2] Superintendent of Schools, Washington, D.C. also believes that the teachers should be given an opportunity for self-improvement by offering an increased salary reward for increased efficiency and preparation. He then goes on to list six items that an adequate salary schedule should include: 1. A beginning or minimum salary adequate to induce capable young men and women to make satisfactory academic and professional preparation to enter the teaching profession as a life work; 2. A Provision for placement for previous service in teaching that en-

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[1] W.J. Webster--Abstracts of Addresses at Boston Meeting of N.E.A. Dept. of Supts. Feb.26-March 1, 1928

[2] F.W. Ballou--op.cit.

courages teachers of experience and proven merit to seek employment on an advanced salary; 3. Provision for annual increases in compensation sufficient to prompt teachers to continue in the teaching profession; 4. A maximum salary which shall constitute more than a living wage and sufficiently high to make it unnecessary for a first class teacher to seek administrative or supervisory work exclusively for financial reasons; 5. Provision for higher compensation to the teacher for unusual or exceptional preparation for her work or superior ability in the art of teaching; 6. Provision for leave with part pay for professional study.

Ballou concludes his article by saying, "A salary schedule which is characterized by these elements will justify persons of unusual ability in entering the profession, will reward them for service faithfully rendered, and will give financial recognition to superior ability and accomplishment."

Adoption Of Improved General Science Textbooks

Another important device for improving the teaching of General Science in the Junior High School is through the use of the Improved General Science Textbooks.

New And Original Textbooks Needed

With the advent of the new type of Junior High School, new and original textbooks are, without question, needed to carry out this institution's new ideals.

These textbooks should approach each subject through the medium of the child's life interests if such academic studies as General Science are to have the vitality that the Junior High School expects them to have.[1]

Old Method Of Selection

A short review of the old method of selecting and adopting textbooks as compared with the new will greatly assist us to appreciate the value that we moderns place upon the textbook as a teaching aid.

In the beginning and for a long time after, the school text books of United States were chosen in the majority of cases by the teacher without suggestions of any sort from any superior authority. It was not until after 1870 that there were indications of leanings toward supervised textbook selection, and while these leanings were developing, many teachers were hired by book agents to sway their supervisors towards certain books. This was the period of sharp competition among publishers and, agents were willing to employ any method, fair or unfair, to have their books adopted in the schools. For a decade wildfire competition raged, but in 1890 several publishers (individuals

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[1] Allyn and Bacon--The Junior High School Movement

not firms) decided to launch a movement against the unbusiness-like methods used by other publishers. Their steady honest business-like methods described in Alfred Iverson Branham's article "The Development of American School Textbooks" in the 1930 issue of the American School Board Journal, finally smothered the so-called sharp competition of the past decade and indirectly aided in the improvement of the textbook content that has given us our good books of today.

New Method Of Selection

The old method of selection (by the teacher) has given way to new ideas, some good and some not so good.

At present, twenty-five states have selection of textbooks for the public schools by the state board of education or by an especially created textbook commission. Five states have selection of textbooks by a county board of education or by an especially created textbook commission. Eighteen states, in which there is neither state nor county adoption, have textbooks selected by district school authorities.

New York City has the multiple list plan, that is, once a year publishers may submit books to the committee of superintendents who in turn submit them to the committee of teachers for examination. If both committees find the books suitable, they are listed on the "open list" for a period of five years. When new books are needed this "open list" is consulted. The books that are finally adopted are used for five years.

Chicago, Philadelphia, and Cincinnati have similar plans but with slight variations.

Some states have what is known as the "state uniformity

laws". This means that the state board of education or the state textbook commission shall adopt both basal and supplementary textbooks for use in the public schools and that these books cannot be changed within five years unless a three-fourth vote of the members of the board or commission favors the change.

This state uniformity idea is supposed to lessen the cost of the books; to supply the schools with the best textbooks (local boards are supposed to be poor selectors as compared with state boards which are composed of individuals thoroughly acquainted with the educational problem); to avoid a large increase in cost owing to a continually shifting population; and finally to form for the state a minimum course of study that can and will be taught in all the schools.

In actual practice, however, this uniformity idea has actually increased the cost of the book (taking into consideration the decrease in the texture of paper, binding and printing as well as the quality of subject matter that the publishers must make in order to sell the book at a cheaper price to the state). It also has a tendency to destroy the idea of teaching the child rather than the subject matter for some students need special types of books that the wideawake teacher could supply as either basal or reference books if she were allowed. City school children require more difficult textbooks than rural or small country schools. This state uniformity idea has also irritated many teachers and superintendents; and all in all has not as yet demonstrated its superiority to the smaller county or local selecting agencies.

Some of the states having these laws, however, allow the commission or board of independent school systems to adopt their own textbooks, regardless of the state uniformity law.

Georgia has a book selection law called "yoemans law". This allows any publisher to submit textbooks for examination with a view to adoption, the prices offered being net wholesale and exchange. The retail price is fixed by the board of education and cannot exceed fifteen percent. of the net wholesale price added to that price. Copies of all books adopted under the "yoemans law" must be filed with the state department of education accompanied by a sworn statement of the net wholesale prices and exchange prices. Such books and such prices are subject to inspection by any citizen of the state. Books once adopted cannot be changed during a period of five years. Georgia also has the state uniformity laws.

In some communities the board of education may be legally charged with the selection of textbooks, but often these boards are wise enough to leave this selection to the superintendent who in turn shows a great deal of sense by demanding the cooperation of the principal and teachers in the selection of the books to be used. The real acid test of a book's worth is its actual classroom efficiency. In reality, is it not the teacher, herself, who should be the "final" judge of what books will work and what books will not work in her particular situation.

This supervised textbook selection has a decided advantage over the old method of selection because the supervisors are capable of selecting several of the best books that ought to

work and the teacher herself may choose from these selected books. If the teacher were left upon her own resorts, as she formerly was, no doubt she would select several inferior books and choose from these.

If the textbook is to be the foundation upon which the lesson is to be built, then, there seems to be no reason why great care should not be taken in the selection of these books.[1]

Guy M. Whipple in an article entitled "The Selection of Textbooks"[2] states his belief that a variety of texts should be at the disposal of the teachers and pupils, even if one text must officially be adopted as basal; and that before making a final selection the teachers should be given an opportunity to try different texts after which should come conferences at which the teacher may reveal and discuss the comparative merits of the several books that she has tried. Then, if but one of them may be officially selected as basal, it may be possible, however, to provide numerous copies of the other good texts for reference and supplementary reading. Some such plan of selection would have the advantage of basing the decision on the acid test of experience, of acquainting teachers with several series of books, and of enriching the materials of instruction.

Essential Points For A Good Book

In the selection of these new books there are some important points that must not be overlooked.

The first thing to consider is the durability of the book. Will it last from four to five years, since that is the average length of time for which it is purchased. Much attention should be given to the strength of the binding and the texture of the

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[1] Branham, A.I.--Am. School Board Jour.--Devel. of Am. School Texts

[2] Whipple, G.M.--Am. School Board Jour.--May 1930

paper.

The next thing to observe is the quality of type or printing. Is it faded, blurred or hard on the eyes; or is it clear, of average size and easy to read.

Third comes the style of presentation. Is it orderly, interesting, clear-cut, straight to the point with comprehensible English and subject matter to fit the type of students who must use it. A book should not be condemned if it does not present its subject matter by problems, but this style of presentation in the majority of cases lends the greatest assistance in transmitting easily that which the author and teacher wishes to put across. Some books are marked out in chapters or parts or both, but the subject matter is so arranged as to form distinctive units. In such cases books should not be cast aside because they are not "marked out" in Units.

Another important feature to be considered is, Is the Material built around the Seven Cardinal Principles which are the Fundamental Objectives of Secondary Education. Many books list the objectives of the books in the introduction. Sometimes probably but four objectives are listed, but if they are interpreted correctly the examiner will find that they include at least six of the seven cardinal principles. Whether the objectives of the book are listed or not, the examiner should review the book to see if these seven fundamental objectives are truly carried out.

The fifth step should be to determine whether or not the book is adaptable to the organized course of study in use in the

school system.

The lessons in the book should be well organized, having plenty of clear, interesting, correctly proportioned illustrations; practical and helpful line drawings; correctly colored plates; subject matter logically unfolded, one step at a time; fundamental laws and principles made clear at the time of need; much confusing technical detail, footnotes, and such interruptions omitted, and finally having a good vocabulary and bibliography.

Some sort of general introduction to each chapter or unit should be present, either in survey question form, short history of what has gone before in blackface type form, list of questions answered in chapter, questions for discussion or problems and suggested projects.

The book should also have a practical summary at the end of each chapter for quick and effective review. The summary may be in story or outline form, self-testing exercise form, or fact and though question form. The first and third forms are best suited to the book minded and highly intelligent student, while the second form is best for the mediocre student.

The book should be written by one who has had actual experience in teaching General Science to the secondary students.

There are a few good points that a book could and often does contain, but if it is lacking in these, yet agreeing with the major points, the book should then not be condemned. A capable and enthusiastic teacher while preparing her lessons can supply these herself. Three such points are as follows: Sug-

gested debates, experiments for the home laboratory, and practical exercises, attainment and fundamental concept tests.

Points To Be Omitted

Then, while selecting a book, consideration is often given some items that ought not to be considered at all, such as the reputation of the author. Sometimes new unknown authors produce better work than well-known authors. The date of the copywrite should not be taken into consideration at all times. A book does not necessarily have the best up-to-date material because it is of the latest edition. It may be but the mere "hack work" of a hurried author. The publisher's name must also be as neutral a point as possible. Sometimes unknown publishers produce better books than well-known ones.

Visual Education As A Device For Aiding Instruction

After the teacher has received her good basal and supplementary books, she still has another important item to think about. The majority of her pupils will not be so book minded as to be able to learn from the verbal lesson alone. They must have additional aids to supplement even the textbook and reference books. This new and effective aid is called "Visual Education".

Many people have misinterpreted "Visual Education" to mean Definition
Motion Pictures alone. This is indeed a wrong conception of the term since in reality Visual Education means the presentation of knowledge to be gained through the seeing experience. The seeing experience has always been man's simplest and most natural means of gaining information. Objects, pictured illustrations, maps, and charts have played an important part in teaching for centuries, and have long been recognized by progressive teachers as not only valuable but indispensable.

As the high school population has grown much faster than Need
has the population of the country, while the percentage of people of high grade intelligence has remained approximately constant, the proportion of these gifted individuals in the high school has greatly diminished. There is little reason to doubt that the greatly increased enrollment has been recruited in a large part from the lower levels of book intelligence. We are faced, then, today, with the situation where the old verbal type of instruction still tends to dominate school instruction, but where, because, of the changing level of learning ability of

the pupils, it is decreasingly effective as a teaching method. This change in character of the high school population, and the consequent change in the relative ability of the pupils to learn from printed symbols we have tried to meet by the introduction of new teaching methods. One of these is the use of visual instruction as a teaching aid.

Types Of Visual Aids

In the teaching of General Science there are many types of Visual Aids that could be used. Such as: Stereopticon view, flat pictures, graphs, motion pictures, lantern slides, demonstrations, maps and globes, models, specimens, diagrams, the blackboard, cartoons, charts, dramas, trips to museums, field excursions, posters, etc. The knowledge of when and how to use each of these aids requires a great skill and technique which is acquired only by practice and study.

Dangers In Using Aids

There are, however, some dangers that may occur while first learning to use these visual aids. Some such dangers are as follows: the using of films when demonstrations are a superior form; the using of visual aids when verbal explanations are sufficient; the using of poorly selected films; the failure to thoroughly prepare field trips, thus causing wasted time, money and effort; and finally, the failure to arouse interest with slides because of inferior explanations.

General Technique

In the teaching of General Science, the teacher may have to arrange the entire sequence of the course with the view of arriving at topics when they can best be taught by field trips, study of live specimens, etc. The teacher should always be on the lookout for any opportunity for the pupils to make and use dia-

grams, charts, models and such.

There are three definite and important steps in the development of a lesson. First, the assignment, second, the laboratory, or research period and third, the review.

Visual aids are valuable to the assignment for new subject matter or a new unit may be introduced, giving a general idea of it or displaying and explaining a beautiful scene pertaining to the subject for appreciation. For example, if one is ready to introduce the unit on plant life, beautiful scenes of flowers, trees, etc., may be shown. Films on "Yellow Stone National Park" would meet this requirement very effectively.

In providing concrete information in the preparation of assigned work or in the execution of a given project, visual aids are educational instruments of tremendous value. At this step in our procedure, pupils are led into new and strange experiences while seeking understanding---seeking new mental images as basis for intelligent judgment and comparison, in order to carry on their activities. Here the various visual aids become absolutely necessary and are used much as dictionaries and reference books.[1]

The teacher must be very careful, however, in deciding when visual aids are necessary. The general rule to go by is "when pupils lack adequate imagery". If the pupils cannot imagine the ancient mode of travel by boat, then it is time to show them pictures, models or the actual specimen, according to which is the handiest, but if pupils have seen this mode of water travel before and can "see" it in their minds, then it is a waste of time to show pictures of what they already clearly know.[2]

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[1] Dorriss,A.V--Visual Instruction in the Public Schools

[2] Wood,B.D. and Freeman F.N.--Motion Pictures In the Classroom

At the psychological time in this research period, when the interest is keen and an urgent need for new knowledge is felt by the students, the value of visual aids, such as the excursion, the flat picture, vivid information, can hardly be over-estimated.

In an instruction or preparation period it is strongly advised that only a few flat pictures, slides, or stereographs be used at any one time, and that these be studied slowly and carefully with a definite purpose in mind. If the subject is long and possibly tedious in places, frequently worth while visual aids should be used, if possible, to stimulate the pupils' flagging interest. If at any time a lecture must be used, it should be enlivened by the use of visual aids. A film ordinarily should not exceed four hundred or five hundred feet in length, and should bear directly on the specific topic under discussion. The introduction of any additional subject matter, at such times, tends only to distract interest and attention and to waste valuable time.

Visual aids make it possible to review a series of lessons or experiences in a concrete, connected way. The review lesson occupies a most important place in the technique of teaching. It is the time when the important principles or facts are summed up and emphasized. The object of the review is two fold: it gives a rounded survey of the material previously studied in detail, and it corrects erroneous impressions or misunderstandings. Here the film and the slide serve the school needs most effectively. No other visual aid can so quickly and interestingly review the whole field of previous study and research, and thus, through

sooner becomes interested in the graph when he has to give it up and take, sometimes, something entirely different from the first. Often the lesson is still progressing, verbally, and in such cases the student looses the thread of the conversation while absorbed in the stereograph. Then again, some teachers insist upon passing around too many stereographs at one time, thus the result is a great confusion of motley ideas in the pupil's mind. If this method is to be used with any sense of effectiveness, just a few graphs should be passed at one time, questions as for what to look should be placed upon the blackboard, and plenty of time should be allowed for each student to observe the graphs, and the verbal lesson should be halted until the business of the graphs have been safely tucked away.

The third way to use the stereograph is considered as the best. Two or three stereoscopes are placed on a table in a corner of the classroom, or the library, where they may be consulted just as any other type of reference. Each pupil then may take as much time as he desires in the studying of each stereograph.

In the assignment of a lesson, the teacher may use slides to stimulate interest in a new unit or subject matter. She may also use slides for conveying information during the socialized recitation period. This would be four-fold in its purpose: Slides

1. The pictures may be viewed and appreciated by the whole group at one time.

2. The interest and attention of the pupils will be more easily held if the pupils are given a chance to lead the discussion of the subject which the slides illustrate.

3. This opportunity of leading a discussion will develop poise in timid boys and girls.

4. This opportunity will be the best way to teach good oral expression.

The teacher should consider as well as adhere to the principle that it is far better to show a few good slides dealing with one phase of the subject rather than taking up the whole class period by showing twenty-five to fifty slides dealing with many phases of the subject. This would give the pupil the opportunity for study and reflective thinking.

The teacher should also examine very carefully all colored slides for misrepresentations. For example, bananas should be shown being picked green instead of yellow.

In reviewing lessons, slides may be used effectively to recall and establish more permanently in the minds of the children the important facts or situations which have been studied.

In the past teachers have spent a great deal of time in making careful drawings on the board only to have them erased a short time afterwards and probably repeated at some future time. The teacher may now make her own slides and the care as well as the time involved will not be wasted but rather preserved as the teacher may place these slides on file in a suitable cabinet and show them as many times and as often as she desires. The teacher should also teach her pupils to make their own slides. Although such slides would seem poor to the teacher it would undoubtedly benefit the pupil tremendously. The directions for slide making may be obtained by referring to page 166 of "Visual Instruction

in the Public Schools" by Anna Verona Dorriss.

The teacher should instruct the pupils in the use of slides as aids to lecturing, rather than merely talking about the slides.

The Demonstration

In Schools where all pupils cannot work on the same problem because of the small amount of apparatus, demonstration by the teacher becomes a necessity. Pupils should be so seated so as to allow perfect vision.

The teacher should carefully rehearse the demonstration if there is any doubt as to its possible success. Nothing is more disconcerting to the conscientious teacher, or more demoralizing to the work of the hour, than to have a demonstration go wrong, even though the instructor is able to say, "Well you know how it should have turned out, anyway." Distraction and disorder, resulting in the discomfiture of the teacher and a wast of time of the class, are likely to ensue from demonstrations which are delayed and drawn out while materials are assembled or repaired during the demonstration.

The Excursion

The excursion should be very carefully prepared in advance. The teacher should first make sure that there really is an urgent need for the trip. If the trip is absolutely necessary, then she should ask permission from the owner or manager to visit the place desired. The teacher should be well familiar with the place she is taking her students to so as to eleviate much waste of time. Before the excursion, a discussion should take place to decide what questions are to be solved by the trip. A mimeographed set of questions, directions, schedules and a signal for assembling the group will prevent much confusion, misunderstanding and will

save a great deal of time in attaining the desired results of the excursion. The owner or manager, if approached diplomatically, will, no doubt, do much to assist the pupils in solving their problems.

Flat Pictures

Pictures when used as sources of information should be introduced into the teaching procedure as the need arises to objectify and thus clarify the impression upon the thought of the learner. Since the picture is a partial substitute for some reality it should be treated as material for definite study. It should arouse thinking on the part of the pupil, and the alert teacher will endeavor to stimulate his observation power by skillfully constructed questions and suggestions. Children should also be encouraged to bring in well selected photographs or prints that illustrate the new ideas presented in the daily lessons. Flat pictures may also be thrown on the screen by the use of an opaque projector for group study.

Flat pictures should also be placed on reference tables for individual study. At special occasions various pictures should be displayed on racks or the bulletin board in the science room.

The teacher should remember that the modern textbook has many good pictures and that when the author has dedicated a full page to a picture, there must be some special reason for his doing so. She should study the picture from every point of view before discussing it with her students. She should never leave a photograph or diagram unnoticed.

Flat pictures in some cases must be aided by models, actual specimens, stereographs, etc., because unless they are painted by

skilled artists their colorings are not true; because of the lack of depth, distorted ideas are apt to develop, and finally, because the pictures lack the power to show changes in processes or activities, and therefore can only reveal a certain momentary situation during a process or a definite circumscribed section of a scene.

The Motion Picture

The motion picture[1] arouses interest, holds attention, and ordinarily compels the emotional as well as the mental comprehension that makes learning effective and enriches human relationships.

The teacher must be alert and wide awake to see that films are introduced at such times as to make them an integral part of the lesson. Before showing a film to the class, the teacher should review it closely if she expects to be able to prepare the class for observation and to plan her own introductory and accompanying remarks. She should not, however, do much talking during the reeling of the film. After reviewing the film, herself, then she is ready to start a class discussion to unearth important questions from the students, she may introduce the film with a few brief, but clear, remarks as to its content, purpose, and what the pupils should gain and retain from it. Then she should run the film.

When an important but extra long picture is shown the film might be stopped to make sure that all the important matter has been absorbed. If a film consists of two or three long reels, one or even but one half of a reel should be shown per day. This would insure thorough work and study. Then again, in order to

[1] Davis, I.C.--School Science and Math--May 1923

create constructive thinking, close observation and alertness, the film could be stopped unexpectedly to have the pupils anticipate the ending. They could write papers to be read the next day after which, the remaining film could be shown. No doubt, the students would be greatly surprised to find that what they had deemed as important, probably wouldn't even be mentioned in the film. The pupils would then begin to realize the importance of film material.

After the showing, time should be taken to discuss the important points of the film and to rerun it if all students did not grasp what was required of them. Following the second reeling, there should be some sort of "carry-on" work such as a written or oral examination for the facts and principles, theory summary, or conclusions. The pupils may be asked to schematize the problem as presented or to have a general discussion, each pupil asking questions upon the film. This would help a great deal towards humanizing it. Another idea for furthering the work of the film, and one that would also aid the development of the research ability would be to have the pupils test the accuracy of the film with the facts gained from laboratory demonstrations and readings from various books.

Sometimes films are not self-explanatory, that is, there is no accompanying lecturer or printed explanation with the films. In such cases, the students should be given a chance to use their own reasoning power before the teacher explains seemingly unclear points.

At times it would seem advisable to allow different groups

of pupils to prepare lectures on the films. Questions could be raised by the different members of the class and a general discussion might follow.

The teacher should not require note taking during a film because of poor illumination and of a waste of time in transferring thoughts from the film to the paper and back again to the film.

Many types of problems can be presented by the use of films in a much shorter time than by the use of laboratory demonstrations. For example: The film on the Telephone presents all the facts and principles in ten minutes that must ordinarily take an hour or more to demonstrate in the laboratory. In order to show the process of the development of plants in the laboratory, weeks and sometimes months are required to complete the task, while a film may show these processes within but a few moments. The historical development of the machine, the steam engine, the telephone, the gas engine, the electro-magnet, and the evolution of some of our manufacturing processes as well as the history of the lives of our great Scientists (Edison for example) can be presented in a few minutes with a more effective and permanent result than by weeks spent on reading, memorizing and reciting these facts.

Then, there are some phases of Science that can satisfactorily be demonstrated in the laboratory, but which have certain aspects that only the film can present effectively. Such phases are Crystallization, Hearing, Seeing, Smelting of Iron Ore, Formation of Dew, and such chemical and physical changes. The demon-

stration shows crystals being formed, but the eye here cannot detect how they are built up. It takes a well prepared film to solve this important feature. Likewise in the case of hearing, seeing, breathing, etc., they can be demonstrated in the laboratory but the film continues and completes the demonstration.

There are three types of films used to further the laboratory demonstration, however. The film that presents situations to which pupils may react without needing a great deal of explanation from the instructor or from printed matter in the film; the film that provokes problems to be solved; and finally the film that gives contrasting situations, allowing the student to draw his own conclusions as to the proper answer.

The first type of film requires a receptive, passive and attentive mind. It challenges the student's thinking ability, gives him data to work and helps his mind to travel in advance of the material presented.

The second type raises a problem---("What Determines the Power That Can Be Developed By A Dam")---; gives the mind facts to work with---(by use of photographs, demonstrate how the height and width of the dam and the distance of water behind the dam might affect the amount of power developed by the dam)---; and finally by the use of these facts, solves the problem for them.

The third type gives data on both sides of a situation---(by the use of proper photographs and such, one could demonstrate the life of a boy who regards all principles of health, and a boy who disregards all principles of health)---. The contrasting situations which allow students to draw their own conclusions are

much more effective than direct "preaching".

In order to give a clearer idea of how these various visual aids may be used in the studying of various units and subjects, a few specific techniques will be planned in the next few paragraphs.

When studying about cotton, a chart similar to the one on page 522 of Wood and Carpenter's General Science book on "Our Environment: How We Use and Control It", would be most effective in giving the students a complete and vivid idea of the many things the little cotton seed is required to produce. It is best however, to use the actual specimen while helping the students to understand how the little fibers of the cotton boll may be transformed into thread and clothing. At this point nothing can take the place of the actual cotton boll, or a part of the cotton plant that has been pulled up by the roots when the bolls were ripe. This specimen can be handled by every student; they can feel the fiber and the seeds in the tangled mesh.

Naturally, curiosity will bring about many puzzling questions, such as: "How does the cotton grow? What does a field of cotton look like while in bloom? Why does cotton grow in the South but not in the North?, and the like."

If the school is located in such distant states as Massachusetts, of course, a field trip or excursion at this time is out of the question, but the indirect experience that can bring a considerable degree of satisfaction should be given them. This is the most psychological moment to introduce the stereograph. No other visual aid can meet this need so well. The stereograph

shuts out the outside world, instantly transporting each student mentally into a great field of white fluffy cotton and busy negroes. The third dimension, depth, makes these scenes very realistic.

Physical, rainfall, temperature, and vegetation maps must be consulted and read intelligently in order to aid the pupils in understanding the problem of why cotton grows in the South but not in the North.

Perhaps graphic charts may actually be made by the students in order to show concretely where the worlds' supply of cotton comes from. These charts can be used effectively in the opaque projector when individual pupils are reporting to the group the findings of the specific research work. In these various reports the slide becomes indispensable as a means of furnishing concrete information to a group. The large flat picture may be held before the group long enough for detailed study, and all may concentrate on the same point of interest.

After the above thorough preparation the pupils would fully appreciate and understand a film on the cotton industry. It would not, however, have been logical or advisable to use the film at any point before this, because hazy conceptions would have been formed in the pupils minds, wasting time, effort and money.

The Eastman Kodac Company in their investigation described in B.D. Wood and F.N. Freeman's book entitled "Motion Pictures In the Classroom" came to the conclusion that films when logically used prove advantageous.

When the units of Food, Clothing, and Shelter are taken up, it should be a part of the training of every boy and girl to visit mills and factories in order to gain first hand information concerning the production and manufacture of food, clothing, and shelter. It is not enough to read and to see pictures of how cotton furnishes coats and dresses, or how the humble wheat grain produces bread. A more dramatic appeal is necessary to arouse genuine "thinking" attention. When high school students come face to face with human beings toiling in hot, stifling, factories, when they actually talk with these workers and see under what conditions they labor day after day in order to give people bread to eat, shoes and clothes to wear, they begin to understand appreciatively and to think sympathetically regarding economic and social problems.

Upon opening the topic on Shelter an excellent slide of the Cliff Palace of Mesa Verde National Park in Colorado could be shown, and the teacher could spend a few moments relating the story of the mysterious cliff dwellers, who built these huge apartment houses containing hundreds of rooms, far up in the rocky cliffs where overhanging rocks often formed a natural roof. After emphasizing various details to be observed in this slide, she could go on to say that the ancient peoples who built these marvelous houses evidently had reached a comparatively high stage of civilization long before the white man discovered America and that they cultivated the soil, made pottery, cloth, baskets, and stone implements.

In order to acquaint the pupil with the different types of

living quarters the world over, an industrious teacher could find or make slides showing these differences. The ice igloo of the Eskimo, the straw huts of the Chinese, the adobe homes of the Mexicans, the cement and wooden structures of United States are examples of the different types of dwellings that could be shown and discussed. The student himself should decide why the Eskimo builds ice houses, why the Chinese build straw houses, why the Mexicans use adobe, and the like.

After the General Science Class has taken up transportation and the point is reached when pupils begin to demand detailed explanations about old ways of travel by water and roads, then is the time to either take the whole class to the museum, or to send a capable group that will be able to report clearly all of importance that it has seen at the museum in relation to this subject. If the group method is used, then flat pictures, stereographic slides, etc., should be at its disposal to help its report.

While discussing the modern mode of travel many questions are sure to rise about the size, arrangement, material, and general structure of the modern ocean liners; as well as about the types of boats used to carry different products (fruit, lumber) from one place to another, and many other unexpected questions. Now is the time to take the class to the waterfront to study these various crafts. If the school is too far from a waterfront, then the teacher will have to resort to flat pictures, stereographs, slides, and motion pictures to give the pupils an idea of the

sizes, arrangements, materials, and general structure of the different ocean liners. Reference work from various supplementary textbooks, encyclopedias and magazines would also assist in replacing the field trip. The field trip, however, would be the most effective method. It would save time (the trip would take but a day, while the indirect method would take several); the seeing of the actual specimen would give a clearer, more concrete and more permanent idea of the different features of this problem.

Then there is another new phase of travel that all modern youth is vitally interested in. That is the areoplane. Capable students should be encouraged to bring to class to exhibit the models that they have made. Small inexpensive awards may be made for the best model, the judges being the whole class, supervised by the teacher. The winners may then prepare lectures for some one day of the following week on "How to Construct Model Areoplanes for Beauty, Symmetry, and Ability to Fly.

A carefully prepared field excursion to the nearest airport would be very valuable to the students. They should have a definite idea of what they want to know after they arrive there. Some such problems might be: 1. What is the covering of the wings of a real areoplane made of? What kind of seats do they have? 3.What does the inside of the cockpits look like. 4. Of what material is the body of the airplane made: 5. How are the straps arranged that hold a person in? 6. What are the various levers used in the operation of the machine and how are they constructed? 7. What type of gasoline is used? Of what is the

propeller made? and such questions. If the pilot is approached in a diplomatic manner he may explain the operation of the machine, and why it rises into the air and why and how it drops to the earth again.

After the trip, the teacher and pupils should make definite use of all information gained.

A film on the history of transportation from the earliest days to the present would act as a sort of quick and effective review after all the material on transportation has been covered.

Then, while studying about insects, many questions as to their life and habits will arise. The actual live specimen, such as the spider or caterpillar cannot be handled and examined as would be necessary if all arising questions were to be solved.

At this point, pictures such as the stereopticon slide, which shows the spider magnified many hundred times should be introduced for this is the best method for studying insects in detail. It is not always possible to get animals to perform as desired. The spider or caterpillar will not always spin naturally when confined in jars or dry aquariums. There the motion picture is unsurpassed even by nature itself. By the motion picture insects and other living creatures of every description from all parts of the country are brought into the classroom so that pupils may see highly magnified pictures of the minutest creatures weaving webs, spinning cocoons, catching their prey, and living their strange lives in their native habitats, all unaware that anyone is observing them.

By means of the X rays and microscopic attachment used on

the modern camera the naturalists have been able to reveal to us many of the most puzzling secrets of nature. Therefore, even though we have access to many live specimens, other visual aids, such as habitat group cases, colored pictures, stereopticon slides, and motion pictures are of tremendous value.

Equipment

In order to be able to teach General Science successfully, it is very important to have suitable equipment. The minimum essential equipment for a Junior High School is as follows:

1. A room known as a laboratory. In determining the number of laboratory rooms given over to General Science it is first necessary to estimate the probable enrollment during the immediate years to be provided for, remembering that if the course is elective that approximately fifty-three percent (according to a recent study by the U.S. Bureau of Education) of all the students will be in the laboratory science courses. The laboratory should be 22-24 feet wide and 36-40 feet long. This size of room would accommodate classes of at least 36 pupils.

2. The laboratory should be provided with narrow tables with students facing in one direction (for real economy) as the room may then be used for demonstrations and recitations. 9, 12 foot tables, 22 inches wide, placed 30 inches apart leaving room at the front end for an instructor's desk as well as space for the instructor. This would accommodate about 36 pupils and still have plenty of room for window shelves, germinating beds, sinks, storage cabinet, etc. The laboratory should also be equipped with good blackboards.

3. Simple but adequate apparatus for carrying out the minimum essential experiments and desk demonstrations in regard to each unit as worked out by Lunt and Haley.

4. The laboratory should also be equipped for Visual Education: A room should be provided with shades that will render the

room dark very easily; b. There should be available a motion picture machine of such a nature that it could be quickly stopped, reversed easily and the speed changed without too much difficulty; c. The room should be provided with two or three stereoscopes and a small cabinet of stereographs pertaining to every day science; d. the laboratory should also be provided with exhibits on different phases of science, graphic charts, stereopticon slides, flat pictures, photographs and prints, maps and a globe, posters, specimens and models.

5. The laboratory should be further provided with several copies of each of the standard textbooks in General Science to be used mostly as reference books, plus a basal standard textbook. In addition there should be available, pamphlets and magazines of scientific nature.

6. Finally the laboratory should be equipped with radio facilities, which consist of a suitable easily regulated loud speaker, and microphone inserted in the wall or at certain convenient positions suited to pupils' listening. This may be controlled by a masters' set in the office of the principal or some such central position.

Radio Education

The final device, to be considered here, for the improving of General Science Teaching is the Radio.

At the present time, education by radio is in the making. In the attempt to become a part of the school technique of instruction, it is struggling against many odds. Ohio, today, seems to be the only state that has done any extensively successful work in presenting radio education to its schools. Experiments after experiments have been and are being tried over various commercial stations. A few examples of these experiments[1] will be listed in the following few paragraphs.

Brief History Of Radio Educatio

In 1920, stations W.W.J, Detroit and K.D.K.A., Pittsburg started to broadcast educational features and have continued to do so to the present time. In 1921 The Radio Council of the Payne Fund proposed to the United State Office of Education that they undertake the broadcasting of educational programs for the benefit of the public schools of United States. Due to too much Federal control, however, the Office was unable to undertake this program of work, but expressed a willingness to aid in the carrying out of it by the Radio Commission.

The Massachusetts Bureau of Education, Division of University Extension is given the credit of being the first organization to give real educational courses by radio. During the four years following September 1923, twenty one courses of eight lessons each were given by Educators from Station W.B.Z. The speakers were paid by the enrollment fees sent in by persons who followed the course of study.

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[1] Reese, W.L. Am. School Board Jour. April 1930--"Radio Takes On Education"

The Haaren High School of New York City, seems to have been the first public school to have given radio programs for educational purposes, 1923.

In the Cook County of Illinois talks were given over the radio by the State Superintendent Francis B. Blair and the County Superintendent Edward J. Tobin and other educators. Students had opportunities in appearing before the microphone in music and oftentimes the best papers written by the different students were read over the radio. Mr. Tobin expressed his belief that we should have public stations for educational purposes rather than to rely upon commercial stations.

Qualifications Of Radio Educational Program

Whatever the method of broadcasting used, however, these educational programs in order to be acceptable both to the teacher and to the school officials, must be free from all advertising, commercial or propaganda features. They must meet the same impartial tests as the textbooks and be closely related to the regular program of classroom instruction. In order that these ends may be met, school officials, local and national broadcasting companies, state and government agencies must cooperate in developing and in directing these programs.[1]

Until this time arrives, however, many schools could have a radio outfit (station and receiving units) in the school building itself. John Carr Duff,[2] Principal of the Benjamin Franklin Junior High School, Uniontown, Pennsylvania describes a Practical Hook-Up for the Unwired Building as he has had it installed and successfully used in his building.

Pupils of the General Science class in this case, could

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[1] Ballou, F.W. Common Ground--Apr. 1930

[2] Duff, J.C. School Executives Magazine--January 1929

present a drama from their own laboratory to pupils in the other rooms without the bother of elaborate stage settings, costume, and weeks spent on memorization of lines. Exceptionally fine work of the various science students could be broadcasted to the rest of the school. By the means of the phonograph pick-up important scientific material broadcasted from the commercial stations at inopportune moments may be preserved for the General Science class until the proper time.

Radio Education By The State

If, however, another state should offer such advantages in radio education as does Ohio, then the first thing to be considered before installing the radio equipment in the schools is the aims and objectives of these programs. The principal, superintendent, and supervisors should learn of some of the General Objectives of radio education and from these should draw up a list peculiar to their own situation.

Emerson D. Jarvis, Superintendent of Schools, Fort Recovery Ohio in an article in the November 1930 issue of the American School Board Journal gives a detailed talk on ten main objectives of the radio lesson. Most of these objectives have been formulated from 572 answers noted in the annual report of the Ohio School of the Air for 1929-30. The ten objectives stated and briefly explained are as follows.

Objectives

1. Radio assists classroom teaching.--For example, every science teacher must keep the material to be studied fresh, true and recent. Without the assistance of the radio this would, of course, be very difficult for several reasons; first, textbooks are purchased for five or more years; the teacher would be finan-

cially unable to purchase a copy of all the new textbooks and scientific magazines published, and physically unable to review each new book, selecting the new subject matter so that she may either lecture on it or lead the pupils to find it by reference work means.

Here, the radio would aid immensely by having the best scientists and authors or their representatives give their new theories, discoveries or inventions in a series of short radio lessons. This would save both the teacher's and the pupils' time by not having to deal with many bulky books in an attempt to find the latest and best material.

2. Creates, Holds and Utilizes Students' Interest.--The ordinary student just simply cannot "get started" on his assignment from an ordinary textbook that lacks the warmth and vitality of the personal touch. A broadcasting teacher, however, adopts the friendly, conversational tone, uses pauses, raising or lowering of tone and such methods of vocalizing that markedly aids in arousing, holding, and utilizing the pupils' attention and interest to the best advantage.

3. Stimulates Voluntary Self-Activity Along Desirable Lines. --Curiosity tends to lead pupils into research for more information or for the verification of the information received. If he is successful in one research he is sure to start another when the incentive is given him. By this research work, oftentimes, latent abilities in the children are brought to light and further developed. Contests, prizes, and letter correspondence to the radio instructor also stimulates self-activity along the proper

lines.

4. Broadens Vision of Pupils.--Upon hearing the voices of great men, such as the President of United States, various Master Educators, etc., the students will begin to realize that these men, whom they had imagined as endowed by birth with some great gift for succeeding, are human after all, and that it is certain sterling qualities of the characters of these men that have caused them to succeed rather than some super-natural gift of the Gods. Any secret ambitions of youth will not, therefore, be so easily crushed when there seems to be a possibility of success.

5. Develops Further Intellectual Culture.--Radio education also develops an appreciation for music, art, science, etc. This attitude development which leaves vivid and permanent impressions with the pupil, has proved itself far superior to the factual cramming idea that leaves but vague, transitory and fleeting memories.

6. Inspires the Pupil to struggle to be like his great musician, his great scientist, his great educator, or whatever his idol happens to be.

7. Develops habits of concentration and thought.--The pupils realize that they are left upon their own responsibility to get all of the important features of the program, and that if they do not they will only work hardships upon themselves. There is no possibility of questioning the speaker at the time as to what he has just said or meant about this fact or that. When it comes to an oral discussion or written test following the program they will be simply "left stranded".

A radio speaker has "boiled down" his subject from a fifty minute lecture to a fifteen minute talk, the result being concise, well-organized and rhetorically perfect oral thought. It is therefore more easily for the student to adopt this type of thought by actually hearing it.

8. Stimulates the efforts of the teacher.--It gives her new examples of lesson plans, exercises, and improved methods of interesting pupils; it aids her in finding individual differences and helps her to avoid vagueness, useless repetition and harsh, undesirable tones of voice while presenting subject matter to the pupils.

9. Advances the cause of education by giving the patrons and parents a chance to realize the progress of education.

10. Serves as an instrument of progress.

Equipping School For State Radio Education

After the aims and objectives peculiar to the school have been decided upon, then a great deal of care must be given the selection and installation of equipment. E.D. Jarvis[1] firmly believes that the high grade sets pay in the end and proceeds to explain the reason for his belief. Jarvis completely explains the equipment needed from the small grade school, through the small high and consolidated schools to the larger systems. The small grade school could be easily taken care of by a small table set such as one has in the home. The larger the school system, however, the more powerful the set must be and the more accessories, such as amplifiers, etc., the school will need.

Procedure Before Lessons Received

After the school is ready to receive radio instruction, the Principal should give the teachers an opportunity to hear about

[1] Jarvis E,D.--Am.School Board Jour.--Feb.1931

three radio lessons of their particular subjects. Then either he himself should give or he should have a capable teacher give a demonstration of how this new aid is used, the preparation necessary for the lesson, the actual operation of the lesson and finally the review.

The Ohio School of the air supplies the teacher and pupils with preliminary lesson material. The teacher is supplied with booklets including the subject matter to be covered, preparation and review. The sheets sent for the pupils include pictures, diagrams, a brief outline of the material to be covered, with references and detailed directions for preparation, and even tests for distribution after the broadcast.

If however any school is not furnished with this material, then, the teacher should plan to use the blackboard or a hektograph in the preparation of something similar.

In conclusion one might say that Alice Keith in her article entitled School Radio in 1928-29 predicts that the day is not far distant when leading historians, scientists, lecturers, etc., will speak to school children of the entire land through our broadcasting networks and that when this day does come, radio will have achieved its true destiny.

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[1] Keith A.--Common Ground--Oct.1928

SUMMARY IN OUTLINE FORM OF "THE IMPROVEMENT OF THE TEACHING OF GENERAL SCIENCE IN THE JUNIOR HIGH SCHOOL"

I. Introduction

A. The Present Status of General Science in the Junior High School.

1. Elective

a. 94 of 125 Junior High Schools in Massachusetts have General Science as an Elective Subject.

(1) 7 schools have it elective in the 7th grade.

(2) 6 in the 8th

(3) 26 in the 9th

(4) 12 in the 7,8th

(5) 21 in the 8, 9th

(6) 22 in the 7, 8, 9th

2. Compulsory

a. 20 of the 125 have General Science Required.

(1) 3 schools in the 7th grade

(2) 6 in the 8th

(3) 3 in the 9th

(4) 2 in the 7, 8th

(5) 5 in the 8, 9th

(6) 1 in the 7, 8, 9th

3. Not Present

a. 11 of the 125 have no General Science at all. It is replaced by Hygiene.

4. Facts Revealed by Questionnaire To Most Outstand-

ing Junior High Schools of Massachusetts.

a. Where General Science offered in all grades, unit system seems outstanding

b. One of the standard General Science textbooks used as a basal; supplemented by scientific reference books, magazines and pamphlets peculiar to the school.

c. General Science teaching aided by visual aids of some sort.

(1) Motion Picture

(2) Stereographs

(3) Flat pictures, etc.

d. Very little radio education as yet

e. Preparation of teachers range from normal graduates to Masters of Education.

f. Very few taken courses in how to teach "General Science"

g. Well-trained teachers and suitable equipment necessary to make General Science desired in all the Junior High Schools in all the three grades.

B. Aims and Objectives of Teaching General Science

1. Based on Seven Cardinal Principles

a. Six of Seven Cardinal Principles used effectively as aims in General Science Teaching; Bull. 1920, No.26, Dept. of the Interior, Bur. of Ed. pps. 12-13 (The Reorganization of Science in the Secondary Schools)

(1) Health

(a) Personal health and public sanita-

tion.

(2) Worthy Home Membership

(a) Aids in making repairs to home facilities.

(b) Aids in appreciation and most intelligent use of modern devices for making home attractive and comfortable.

(3) Vocational Guidance

(4) Citizenship

(a) Appreciation for work of scientifically trained men and women

(b) Capable of selecting the expert to positions where expert knowledge required.

(c) Foundation for an intelligent evaluation of services rendered by such experts.

(5) Use of Leisure Time

(a) General Science supplies carry-over work

(b) Leisure time may be spent in experimenting, studying nature, taking trips to industrial places to learn new processes, etc.

(6) Ethical Character

(a) Establishes more adequate conception of truth and confidence in laws of cause and effect.

(b) Develops sane and sound methods of thinking on problems of life.

b. C.J. Pieper and L.W. Beauchamp in the Teachers'

Guide Book, pps. 2 and 3 list four objectives.

(1) The acquisition of knowledge which leads to and assists in gaining an understanding of the elementary forces, materials, and phenomena of the science necessary to the citizen of any modern community in the solution of everyday problems of social and civic significance.

(2) The discovery and development of desirable study attitudes, study habits, abilities, and skills which lead the youth to do and to act, in the schoolroom and out, as a wholesome participating member of society. The study attitudes and habits will include a spirit of inquiry and investigation, a desire to see and to solve science problems arising in his environment, a thorough method of investigation of a problem through reading, experimentation, and other educative activities, the formulation of concepts and conclusions which are valid in the light of the student's investigation, and the interpretation of new problem situations upon the basis of the knowledge gained.

(3) The development of and growth in desirable attitudes toward, appreciations of, and adaptations to our environment in so far as an elementary knowledge of science and the proper development of the attitudes and habits of study, the abilities, and the skills make this possible.

(4) The development of wholesome intellectual interests which lead to a desirable use of leisure time and which give a basis for educational and vocational guidance.

It should be borne in mind by teachers of science that subject matter which leads to information only will never insure the

attainment of the objectives stated. The contents or the materials of the course are nothing more than the medium for study. The technique of study and instruction will determine largely whether or not the objectives mentioned above will be reached. The changes produced in boys and girls through the study of science depend upon how well the teacher keeps these objectives consciously before his pupils by the selection of the proper kind of subject matter and by the technique of study employed.

c. C.J. Pieper--The Supervision Of Natural Science in Uhl and Others--The Supervision of Secondary Subjects, expresses his idea of aims and objectives as follows:

(1) To develop intelligent and sensible mode of adjustment to the physical and biological world, for the enjoyment of the materials, forces, phenomena and applications which constitute our environment

(2) To develop appreciation of the significance of natural phenomena, for the maintenance of physical health and energy through the proper relations with nature's forces, materials, and phenomena

(3) To develop efficient use and control of nature's forces and materials, for the intellectual interest in all of the major individuals and social life problems which relate to the judgment to the environment; the scientific attitudes toward, and study of the environmental relationships.

d. C.O. Davis---Junior High School Education--objectives of general science in Rochester, New York.

(1) To develop the student's power of obser-

vation so that he may be aware of his surroundings in a way that will enrich his experience.

(2) To give the student's an understanding of the common phenomena of their immediate environment

(3) To provide opportunity for practice in applying what has been learned to the solution of new problems

(4) To correct misinterpretations of natural phenomena

(5) To give students some idea of scientific methods of procedure in dealing with problems of a scientific nature.

e. Seven objectives constantly stressed in the teaching of science.

(1) To acquaint the student with the elementary laws of nature necessary for the maintenance of his own and his community's health.

(2) To give the student an understanding and an appreciation of natural laws and their scientific applications to civic problems to the end that he may become an intelligent citizen.

(3) To give the student a comprehensive general survey of the field of science that he may have a broad view of the scientific facts and principles which affect his life.

(4) To give the student training in ideals and habits, accuracy, open mindedness, and honesty.

(5) To give to pupils a broad and genuine appreciation of what the development of science means in modern

social, industrial, and national life.

(6) To develop system, order, neatness and possibly other attributes to the end that they will function in the ordinary affairs of life.

(7) To make pupils able to read more intelligently and with greater interest articles on science in magazines and scientific books of a popular character and to read with greater understanding, literature containing scientific allusions.

f. Wood and Carpenter in their General Science Book, "Our Environment: How We Use It", express the aims of the book in the following way:

(1) To increase pupils' appreciation of the factors of his Environment.

(2) To develop his powers of observation

(3) To train him in the scientific method

(4) To stimulate him to organize his common experiences for use in solution of new problems.

(5) To help him form right habits

(6) To develop his desire to practice personal hygiene

(7) To teach him the specific ways in which the principles of Science are applied to the work of the world so that he may surely realize the importance of science in the home, community, state, nation, and world at large.

C. Qualifications of General Science Teachers

1. Past

a. Purpose of school for mastery of knowledge

b. Work of teacher, to give assignments, hear recitations and to command discipline

c. Mediocre knowledge from common schools or academies of the time, plus ability to hold discipline, only qualifications needed.

d. 1823 Samuel R. Hall established private school for training teachers at Concord, Vt.

(1) Beginning of teacher training idea

e. 1900 importance of teacher training firmly fixed in American minds.

f. In 1923 but fifty percent of the teachers of United States had standard training (four years of high and two of professional training)

2. Present

a. E.E. Lewis in "Personal Problems of the Teaching Staff" states that the minimum standard for grades 1-6 in many cities are four years of high and two of normal, while some require four of normal or college; the high school demands college graduates and sometimes requires from one-half to one full year of graduate work; Junior High gradually demanding college trained teachers.

b. Teacher must specialize in one to three subjects

(1) Day of general teacher, past

3. Future

a. Dean Arthur Wilde of Boston University in the January 1927 issue of American Education predicts that the time

will soon arrive when appointment by the better schools will be almost impossible unless the following qualifications are offered:

(1) Full college course with enough majoring and minoring carried through two years.

(2) Graduate work

(a) Course in Psychology of Adolescence Age

(b) Educational Sociology

(c) Secondary Education

(d) Course in practice of teaching specific subject (General Science in this case)

II. Reorganization of the Technique of the Teaching of General Science in the Junior High School.

A. Salary Schedule as a Stimulant for Self-Improvement

1. Purchasing Power of Teachers Salary

a. If salary was $1000 in 1900 it should have been

1207 in 1910;

2694 in 1920 and

2240 in 1927, if purchasing power were to remain constant during the twenty-seven years.

2. Merits of the Single Salary Schedule

a. Comparatively easy to administer

b. Grade teaching enriched and strengthened by more breadth of knowledge and more technical preparation than represented by the two years of normal training.

c. Incentive to further preparation in both grade and high school positions.

d. Ambitious, well-trained grade teachers have no need to transfer to high school positions for financial reasons.

e. Best of teachers kept in seventh and eighth grades where sadly needed.

3. Single Salary Schedule in Actual Operation

a. Experiment in schools of Minneapolis, Minnesota.

(1) Two classes

(a) Class one

(1a) two years beyond high school, salary starts at $1200 and ends at $2000

(b) Class two

(1b) four years beyond high school, salary starts at $1500 and ends at $2500

(2) Result of Experiment

(a) 20 teachers passed from first to second class

(b) Now there are 38 elementary teachers with University degrees--Only 28 before experiment started.

(c) Extra $500 opportunity of the second class had some effect in stimulating self-improvement.

4. Items Necessary for an Adequate Salary Schedule

a. Beginning or minimum salary adequate to induce capable young men and women to make satisfactory academic and professional preparation to enter the teaching profession as a life work.

b. A provision for placement for previous service

in teaching that encourages teachers of experience and proved merit to seek employment on an advanced salary

c. Provision for annual increases in compensation sufficient to prompt teachers to continue in the teaching profession

d. A maximum salary which shall constitute more than a living wage and sufficiently high to make it unnecessary for a first class teacher to seek administrative or supervisory work exclusively for financial reasons

e. Provision for higher compensation to the teacher for unusual or exceptional preparation for her work or superior ability in the art of teaching

f. Provision for leave with part pay for professional study.

B. Adoption of Improved General Science Textbooks

1. New and Original textbooks needed to approach child through life interests if the ideals of the new Junior High School are to be accomplished.

2. Old method of textbook selection

a. Old method by teacher alone

b. After 1870 leanings toward supervised textbook selection.

3. New Method of Selection

a. By State textbook Commission or State Board of Education (25 states)

b. By County Textbook Commission or County Board of Education (5 states)

c. By local selecting agencies (18 states)

d. By Multiple List plan

(1) Once a year, publishers submit books to committee of superintendents

(2) Superintendents submit books to committee of teachers, if both committees agree, the books are placed on "open list" for five years.

(3) When new books needed this list consulted

(4) Books selected to last five years

4. Essential Points of a Good General Science Textbook

a. Durability

(1) Must last four or five years

b. Quality of type

(1) Clear, of average size and easy to read

c. Style of Presentation

(1) Orderly

(2) Interestingly

(3) Clear-cut

(4) Straight to the point

(5) English and subject matter to fit pupils intended for.

(6) Presentation by problems if possible

(7) Unit idea

(a) Some books marked out in parts and chapters, but material so arranged as to form units

(b) Some books marked out in units.

d. Material must be built around Seven Cardinal

Principles.

(1) Objectives, may be clothed in different phrases than used in the Seven Cardinal Principles, but mean the same.

e. The book must be adaptable to the organized course of study used in the school system

(1) Should have well-organized lessons

(a) Clear, interesting and correctly proportioned illustrations.

(b) Practical and helpful line drawings

(c) Correctly colored plates

(d) Subject matter logically unfolded

(e) Fundamental laws and principles made clear at time of use

(f) Technical detail, footnotes, and such interruptions omitted

(g) Good vocabulary and bibliography

f. General introduction to each chapter or unit

g. Practical summary at end of each chapter for quick and effective review.

5. Points to be Omitted

a. Name and reputation of author and publisher

(1) Unknown author and publisher sometimes produce better books than well-known ones.

b. Date of book

(1) Book having latest date not always the best book. May be mere hack work of hurried author.

C. Visual Aids as a Device for Assisting Instruction

1. Definition

a. The presentation of knowledge to be gained, through the seeing experience

2. Need

a. High school population grown faster than population of country.

b. Extra high school attendence recruited from lower levels of intelligence

c. Percentage of highly intelligent students remain the same

d. Majority, then, must learn by seeing and doing.

3. Types of Visual Aids for General Science Teaching

a. Stereopticon view, flat pictures

b. Graphs, Motion pictures

c. Lantern slides, demonstrations

d. Maps and globe

e. Models, Specimens

f. Diagrams, the blackboard

g. Charts, Cartoons

h. Dramas, trips to museums, field trips, posters.

4. Dangers In Using Visual Aids

a. Using them at the wrong time

b. Using them without thorough preparation beforehand.

5. General Technique in using visual aids

a. Visual aids to introduce new subject matter

(the assignment)

b. Visual aids to assist the Laboratory or Research period

c. Visual aids as a quick and effective means of Review.

d. Stereographs should be used as reference material to get the best results.

e. Slides may be used in stimulating interest in new subject matter, for conveying information during socialized recitation period.

(1) Purpose four-fold

(a) Pictures viewed and appreciated by whole group at once.

(b) Interest and attention of pupils more easily held

(c) Opportunity of leading a discussion with slides develops poise in timid boys and girls

(d) Best way to teach good oral expression

(2) Use few slides at one time

(3) Examine slides for color misrepresentations.

(4) Quick, effective method of review.

f. The Demonstration should be rehearsed beforehand to eliminate failure

(1) Pupils should be seated in such fashion as to allow perfect vision.

g. The excursion should be carefully prepared in

advance.

(1) Must be urgent need for trip

(2) Permission to visit place must be received

(3) Teacher must be familiar with place she is taking pupils.

(4) Discussion should precede excursion, to determine what questions the trip must solve.

(5) List of questions, directions, schedules, and signals must be given each student.

h. The flat pictures placed on reference tables for individual study.

(1) Some flat pictures must be aided by models, actual specimens and such if distorted ideas are to be eliminated.

i. The motion picture must be reviewed by the teacher before showing.

(1) Discussion to discover what questions the film can answer.

(2) She should give a short introductionary speech as to purpose, content, and what to gain and retain.

(3) If film extra long then only part of it should be shown at one lesson.

(4) Film may be stopped half way through to have pupils determine what the ending might be.

(5) After the first showing, time should be taken for discussion so as to clear up any hazy points.

(6) If necessary the film should be rerun a

second time to make sure all important points have been grasped.

(7) A written or oral test for facts and principles, theory, summary, or conclusions may constitute the carry-on work after the film has been shown the second time.

(8) Many processes that would take weeks and months to demonstrate in the laboratory can be shown by the film in a lesson.

(a) Development of plants

(9) Chemical and Physical changes can be demonstrated in the laboratory but the film continues and completes the demonstration

(a) Formation of Dew or Crystals

(10) Three types of films to aid laboratory demonstration

(a) Film that presents situations to which pupils may react without needing a great deal of explanation.

(b) The Problem

(c) The Contrast film

E. Radio Education

1. Qualifications of Radio Broadcasts

a. Free from advertising, propaganda or commercial features.

b. Must meet same impartial tests as textbooks

c. Must be closely related to regular program of classroom instruction

2. Radio Unit in the School

a. Useful until more extensive radio programs by the state, etc. are supplied.

b. Have loudspeaker and microphone in each room and regulated from the office

(1) Pupils in General Science class could present dramas without stage details

(2) Good scientific programs on radio at inopportune times may be preserved by the phonograph pick-up until the proper time.

4. Radio Education by the State

a. A list of aims and objectives peculiar to each school should be formed.

b. Equipping school for state radio lessons

(1) A small grade school easily uses table sets such as we have in our homes.

(2) The larger the school system the more powerful the set must be and the more accessories needed.

c. Procedure Before Lessons Received

(1) Teachers given opportunity to hear 3 or 4 lessons on their particular subjects

(2) Principal or capable teacher demonstrates the preparation before the lesson, the conduction of the lesson, and finally the review.

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